

Suggested Algebra II Course Guidelines

Introduction

These guidelines for an Algebra II curriculum are intended to promote the learning of mathematics by all students and prepare them for further study in mathematics and/or using mathematics appropriately in the workplace. Instruction should provide opportunities for learning new mathematics through the exploration of rich problem-solving situations. Students should use various types of reasoning, be able to communicate their thinking to others using a variety of representations, and recognize and use connections within and outside mathematics. Technology should be used as a tool to help all students understand mathematics more deeply and prepare them for the demands of an increasingly technological society.

The sections and topics in these guidelines are not necessarily sequential. They may be reorganized by individual teachers or schools.

A. Functions and Graphs

1. Understand the concept of a function of one variable and be familiar with function notation.
2. Given a graph, determine whether or not it defines a function.
3. Identify the domain and range of a function; identify the independent and dependent variables.
4. Evaluate a function for selected elements in its domain.
5. Find the sum, difference, product and quotient of two functions.
6. Identify linear, quadratic, absolute value, and exponential functions from graphs and equations.
7. Given a function $f(x)$ and its graph, be able to graph $cf(x)$ (dilation), $f(x - c)$ (horizontal shift), and $f(x) + c$ (vertical shift) where c is a real number.
8. Find the x -intercepts, y -intercept, local maxima and local minima of a function given its graph.
9. Interpret a given graph representing a real-world phenomenon. For example, describe the motion of an object given a graph of time and distance.

B. Quadratic Functions and Equations

1. Find the maximum or minimum, the x - and y -intercept(s), and the values of quadratic functions using graphs, tables and equations. Interpret these values when the quadratic function represents a real-world phenomenon.
2. Solve quadratic equations by factoring.
3. Solve quadratic equations using the quadratic formula
4. Solve quadratic equations by graphing.
5. Recognize when quadratic equations have no, one, or two real roots.
6. Use quadratic equations to solve problems such as those involving geometry, physics, and business applications.
7. For a set of data that can best be modeled by a quadratic function, use a calculator or a computer to find the quadratic function of best fit.

C. Systems of Linear Equations and Inequalities

1. Solve systems of two linear equations in two unknowns graphically, and numerically using tables.

2. Solve systems of two linear equations in two unknowns algebraically using substitution and elimination.
3. Recognize examples of linear systems that have a unique solution, no solution, or infinitely many solutions.
4. Solve a system of two or more linear inequalities in two unknowns graphically.
5. Use a matrix to represent real-world data and apply the matrix operations of addition, subtraction, multiplication, and scalar multiplication to solve real-world problems.
6. Use matrices to efficiently represent a linear system. For 2×2 and 3×3 matrices, recognize the role of the identity matrix and the inverse of a matrix (if it exists); using a calculator or computer, find solutions to linear systems using the inverse matrix method.

D. Polynomial, Rational, Radical and Absolute Value Expressions

1. Use the properties of integral exponents to simplify algebraic expressions.
2. Add, subtract and multiply polynomials, and divide a polynomial by a monomial.
3. Factor polynomials by removing the greatest common factor and factor quadratic polynomials.
4. Evaluate polynomial and rational expressions; evaluate expressions containing radicals and absolute values.
5. Recognize the connection between fractional exponents and radicals such as $x^{1/n} = \sqrt[n]{x}$. Simplify radical expressions such as $\sqrt{54x^2y^3}$ using appropriate properties.
6. Simplify rational expressions such as $1/x + 1/y$ and $(x - 1)/(2x - 2)$.
7. Solve equations involving rational expressions such as $1/x + 1 = 1/3$.

E. Exponential Functions

1. Recognize exponential functions and their graphs and evaluate exponential functions at selected values. Be aware of the role of exponential functions in important applications involving exponential growth and decay.
2. Use graphs and tables to solve problems such as those involving exponential growth and decay, compound interest, and temperature heating and cooling.
3. For a set of data that can best be modeled by an exponential function, use a calculator or a computer to find the exponential function of best fit.

F. Probability and Statistics

1. Use standard deviation measures to compare the scatter of sets of real-world data.
2. Use permutations and combinations to compute simple probabilities.
3. Conduct probability simulations and interpret the results.